Is Domestic Value Addition a Source of Export Sophistication? A Case Study India

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[**Abstract**: *An implication of a globally fragmented production system is that countries which assemble and export high-tech products could reflect a sophisticated export structure while generating low domestic value-added component. Therefore, understanding the relationship between domestic value-added component in export, and the export sophistication of a country would be helpful in assessing if the country indeed achieved a quality improvement through indigenous attempts. However, for countries with export competitiveness essentially on grounds of cheap and abundant labour, rather than technological advantage, there is a significant disincentive to invest in innovation and R&D. This could possibly the case for India, motivating the investigation.*

Results show that exports of sophisticated products, which also belong to the high- technology segment, are paired with low indigenous contribution in the product manufacture. The subscription to imports for exporting high-tech products reflects upon the deficient domestic R&D needed to bolster innovative practices such as product design and engineering. There needs to be a conscious effort to indulge in production stages characterized by high domestic value addition content.]

Keywords: *Export sophistication; domestic value addition; export quality; high-tech exports; India.*

I. Introduction

To the extent that trade structures are a reflection of the production structures in an economy, it is natural to expect exporters of sophisticated or technologically advanced goods to reflect upon a technologically advanced domestic production set up. However, paradigm of international trade has transformed over time with a significant proportion of trade on account of parts, components and intermediate goods indicating that global value chains have intensified over time. This has led to organization of the production systems with specialization in specific segments. For instance, some countries engage at the assembly level while others engage in design and engineering stage of production process; the latter one being characterized by higher value-added component than the former (Gambero and Ramos, 2015). An implication of a globally fragmentated production is that countries that assemble and export high-tech products could reflect (or rather mis-represent in some cases) a sophisticated export (and therefore production) structure (and

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an underlying domestic production) while generating low domestic value-added component.

Therefore, understanding the relationship between domestic value-added component in export, and the export sophistication of a country would be helpful in assessing if the country indeed achieved a quality improvement through indigenous attempts. A higher income generation (i.e. value addition) through exports would further induce domestic demand for goods, in turn benefitting overall economic growth in the country. Alternately, it could simply be argued that the quality improvement in exports is effective through the import channel – resulting from (deeper) integration into global value chains (GVCs), essentially on the strength of imports of high-technology inputs without significant improvement in the indigenous production setup. At a time, when a quarter of global production is exported with approximately 30% of exports from foreign inputs (Ospina, Beltekian and Roser, 2018), an introspection into the relationship between export sophistication and domestic value added component would be helpful to highlight if there are domestic constraints to upgradation and quality improvement as a cause for India's sticky share in world exports, while even the smaller economies such as Vietnam and Bangladesh have shown an export acceleration recently.

Recent research, on indicators of trade performance, links the quality content of export basket with economic growth (Hausmann et al, 2007). Moreover, the growth link is found to be effective above a minimum threshold (Burdon et al, 2018). Therefore, it becomes all the more important for countries to continuously upgrade their export baskets with higher quality products. The issue is more challenging for the non-advanced countries which have relatively low initial quality of products in the export basket while also being constrained to upgrade the export pattern due to relatively low levels of knowledge capital that also varies across commodity goods.

It is obvious to expect the overall quality of the export basket to vary across countries on account of (change in) composition and performance of the endowment factors. However, for countries with export competitiveness essentially on grounds of cheap and abundant labour, rather than technological advantage, there is a significant disincentive to invest in innovation and R&D. This could possibly the case for India, motivating further investigation.

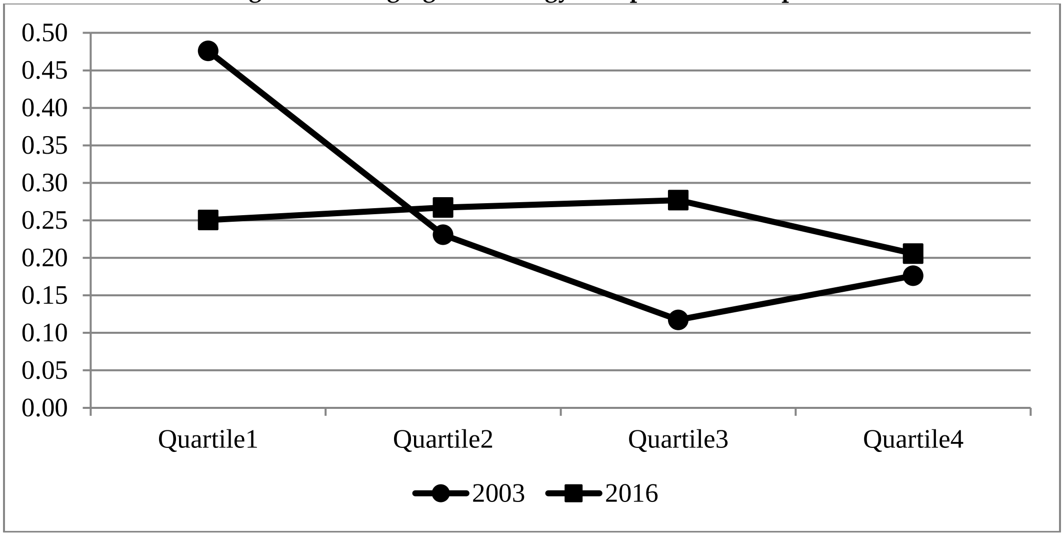
In the present research contribution, the quality concept of a commodity is based on the implied knowledge, which is measured as the weighted per capita real GDPs of all countries exporting the commodity under consideration. The underlying assumption of the measure is that countries having higher per capita income, export goods which have better productivity and efficiency, which in turn reflects on higher use of technology (domestic or imported), knowledge, and R&D; indicating the high quality of product.

II. India's Export Sophistication

Global leaders in export sophistication include Ireland, Switzerland, Japan, Finland, Luxembourg, Qatar, Germany, Singapore, UK, Bahamas, Suriname, UAE.[1] During the period, India has maintained higher sophistication of exports compared with the mean and median. India's Export sophistication exceed by an average 8.6% of the global mean during the period 2003 to 2016. However, the relative sophistication vis-a-vis the world leader is observed to be 42% lower on average during the period of observation. Countries with similar levels of sophistication as India include Australia, Brazil, Bulgaria, Romania, Saudi Arabia, UAE, HK, Kuwait.[2]

In India, the distribution of exports based on their level of sophistication, exhibits convergence over the time. Between 2003 and 2016, the cumulative export shares across each of the four quartile distributions of sophistication levels are relatively equally distributed for 2016 as compared with the distributions during 2003 (Figure 1).

Figure 1: Changing Technology Composition of Exports



Source: Author's computations based on WITS database and World Development Indicators.
Note: Based on the value of product level sophistication, the quartile distribution shows export composition into four broad technology categories of low technology (Quartile 1), medium-low technology (Quartile 2), medium-high technology (Quartile 3) and high technology (Quartile 4).

Since sophistication is a proxy for technology content and R&D, we refer to exports under each of the quartiles categorized into four technology categories - low technology, medium-low technology, medium-high technology and high technology products,

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[1] The highest value of sophistication is not necessarily for the same country over the period.
[2] Stated in alphabetical order.

respectively.[3] Although cumulative export share of the last quartile are lower than the other quartiles, a slight improvement is noted over time. This only shows that India has maintained a stable share of high-end exports, as assessed through sophistication. Likewise, has been the case for export of the medium-low technology products. However, the stellar performance of performance of medium-high technology category is noteworthy due to more than double the export share than in the past. It is the centre stage of transition in the export basket with a cumulative export share of 28%, the highest among all four categories. The expansion occurred at the cost of exports under low technology category. However, the observed diversification into the medium technology segment, though not a prototype now, could have been achieved through indigenous efforts or through the use of imported inputs. The latter possibility depicts a situation of deeper integration into the GVCs which is a characteristic of the present arrangements in international trade.

Therefore, it becomes imperative to investigate if the sophistication of exports, as noted through the expansion of the medium technology segment, complements domestic value added or not. In the absence of a dedicated policy on promoting domestic R&D, the domestic value addition would be low; and the higher foreign value added would reflect integration into the GVC albeit with higher supply-chain dependency. However, mere presence in the GVC is not sufficient for success, as it does not necessarily lead to upgradation and better performance. Recognizing the importance of knowledge features, Gereffi, et al (2005) link the value chains with learning and innovation practice, as participation in GVC does not ensure a free flow of knowledge to remaining firms, which may have comparatively lower performance levels and may continue to lag or even turn insignificant.

III. Data and Computations

In recognition of the fact that export sophistication contributes to higher growth rates of the economy, we focus attention on the relationship with one of the possible channels of improved sophistication, the value-added component of exports. It could possibly be the case that a better integration into GVCs, facilitating access to newer technology and better knowledge through imports, in turn contributes to improved quality of the exports whether through cheaper imports of capital goods or superior variety.

Using highly disaggregated data for the SITC Revision 3, product level sophistication of each of the 261 exported commodities are computed for the period 2004 to 2012. The product level sophistication is an indication of the level of productivity, capital content, R&D as these are reflective of the presence of know-how, technological content,

[3] To the extent that the quartiles are used to study the distribution, a notional categorisation reflecting the technology content is used. Refer OECD (2011) for the technology classification at a product level, based on R&D intensity for OECD countries.

quality; which are reflective in the per capita GDP used in the measurement of product level sophistication, PRODY, as conceptualised by Hausmann, Hwang and Rodrick in 2007. The level of development of countries is proxied by their per capita GDP. The product level sophistication measure is insightful for two reasons. One, it is helpful to understand the exporting pattern of developed and developing countries. Two, at a country-level this can be linked up with the value added measures to make policy interventions through emphasis on income generation, or research and development. The product level sophistications are used to compute the overall sophistication of export basket of a country.

Participation into the GVC is proxied by the proportion of domestic value added contained in the value of exports. Sectors with high value of the ratio are considered less integrated in the GVCs due to their import dependency. In contrast, low value of the DVA-to-export ratio is indicative of a relatively high domestic component of income essentially arising from activities within the economy. This necessitates separating the domestic and imported inputs used for economic activities to assess their impact in increasing the value of exports. The information is not available at SITC 3 digit level. However, estimates of DVA-to-export for 112 sectors of the Indian economy up to the latest year of 2012-13 are available from Veeramani and Dhir (2017). By generating a mapping between the 112 commodity sectors and the 3-digit SITC Revision codes, used in the present analysis, an inter-sector comparison of the DVA content is helpful to add insights on the generation of domestic income.

IV. Measurement Methodology

The methodological details for contribution of the key policy variables and also the model estimation are discussed in this section.

There are close proxies to the export sophistication index developed by Hausmann et al (2007) such as the export extensive margin index at the product level, export similarity index in Scott (2008) and the export similarity index formulated by Wang and Wei (2010). Among these the measure developed by Hausmann and his co-authors has gained wide acceptance in works of researchers such as Jareau and Poncet (2012), Weldemicael (2012) and Finger and Kee (2004).

The dependent variable i.e., industry-level export sophistication is assessed from the income content in exports is computed through export sophistication index as measured in Hausmann, Hwang and Rodrik (2007) and is essentially a weighted average of the level of sophistication of product exports by a country. The weights are reflective of the industry share in country's overall export basket. The product sophistication is measured as a weighted average of income of the countries exporting a given product, the weights being the export share of the country for the product under consideration (Equations (1) and (2)). These computations make use of the data available from the World integrated Trade Solutions (WITS) interface of the World Bank.

$$PRODY_k = \sum_i \frac{x_{ik}/X_i}{\sum_i x_{ik}/X_i} * Y_i \ldots\ldots\ldots\ldots (1)$$

$$EXPY_i = \sum_i \frac{x_{ik}}{X_i} * PRODY_i \ldots\ldots\ldots\ldots (2)$$

where, index k refers to the product, i refers to a country, x_{ik} is the export value of country i in product k, X_i is the total exports of country i, Y_i is the real GDP per capita of the country i, $PRODY_k$ is the sophistication of the product k, and $EXPY_i$ is the expr sophistication of the country i.

Modelling Options

We believe that there exists some heterogeneity across products which makes their impact on export sophistication different from one another. Making use of panel data techniques enables us to gather, use and analyse information on individual products, both over time and across products. The policy variable is domestic value-added component of exports, and all other remaining variations are collectively represented under the individual effects, which do not vary over time. For instance, the level of export sophistication could vary with the skills required in production, existing technology level, and R&D. However, systematic and continuous data on such indicator over a period of time and a range of products is either not available or difficult to compile on a comparable basis. Thus, these can be sources of unobserved heterogeneity which cannot be attributed to DVA alone.

Panel data models can be estimated through pooled OLS, Fixed Effect (FE) and Random Effect (RE) methods. The pooled OLS specification discounts for heterogeneity among the units of analysis, e.g. products and has common constant which ignores all variations on account of cross-sections and temporal effects. The specifications of a static pooled OLS model is as follows:

However, when there are reasons to believe in individual -specific characteristics, as is for the present case for different products at SITC 3-digit level, then a specification that takes into account heterogeneity is appropriate. Two forms of panel model estimation are FE and RE.

The FE model has a unique individual specific component which remains invariant over time. In fact, the FE methods only estimates the time invariant variables. The FE model is valid under the assumption that the individual-specific component is correlated with the idiosyncratic error term. The FE specification can be estimated using then LSDV or within groups method (refer Equation (3) for specification, details on variables are discussed in sub-section on results and discussion).

$$PRODY_{it} = \alpha_i + \beta_1 \, \mathrm{dvax}_{it} + \beta_2 \, \mathrm{go\_r}_{it} + \gamma_t \, \mathrm{t} + \varepsilon_{it} \ldots\ldots\ldots\ldots (3)$$

where, subscripts – i: industry at SITC 3-digit level, t: time period; $PRODY_{it}$: product level sophistication value;

$dvax_{it}$: domestic value added in exports (expressed as per cent); go_r_{it}: gross output at constant prices

The RE model is suitable when the individual-specific component in the data set is uncorrelated with idiosyncratic error term.

There are tests to suggest the most appropriate model fitting the data based on which the best model is selected. These tests are applied on the estimated results of each specification as discussed in a sub-section within the following section on results and discussion.

Reference Period

Data for export sophistication is time taking to gather and requires meticulous cleaning before it is actually complied to generate the index of export sophistication. The reference period is chosen in consideration of many of India's regional and bilateral free trade agreements coming into force. These include the regional FTAs such as APTA, SAFTA, India-Mercosur PTA and ASEAN-India FTA came into enforcement in 2005, 2006, 2009 and 2010, respectively. Many bilateral agreement were also enforced during this period e.g. India-Singapore CECA and India-Malaysia CECA were enforced in 2005 and 2011, respectively; India-Korea and India-Japan CEPA were enforced in 2010 and 2011; India-Bhutan trade agreement in 2006; India-Chile PTA in 2007, and India-Finland Agreement on economic Cooperation was signed in 2009.

Although the required data on export values is available up to 2016, the DVA component of export is available for different sectors of the economy only up to 2012 from Dhir and Veernamani (2017). The reference period is 2004-2012.

Results and Discussion

Table 1 shows summary statistics for dependent variable ($prody_{it}$: export sophistication of a product i at time period t), policy variable ($dvax_{it}$: domestic value added as percentage of export) and other variables (go_r_{it}: gross output and go_q_{it}: rate of real output growth) considered.[4] Each of these variables has panel dimension over product i at time period t. The panel variable is sitc3 for the products and year is the time variable in the data.

As seen from the table, each of panel variable has a high variation between products, thereby showing heterogeneity among products on each of the product characteristics such as the level of sophistication, proportion of domestic value addition in exports, rate of growth and gross output; thus hinting for use of panel data techniques in the analysis.

[4] Data sourced form Das et al, 2018.

Table 1: Descriptive Statistics for Variables

Variable		*Mean*	*Std. Dev*	*Min*	*Max*	*Observations*		
sitc3	overall	527.384	271.5957	12	899	N	=	2250
	between		272.0801	12	899	n	=	250
	within		0	527.384	527.384	T	=	9
year	overall	2008	2.582563	2004	2012	N	=	2250
	between		0	2008	2008	n	=	250
	within		2.582563	2004	2012	T	=	9
$prody_{it}$	overall	17168.45	9446.788	136.6837	54608.62	N	=	2250
	between		8808.94	700.0468	42656.29	n	=	250
	within		3452.594	-2692.91	42228.34	T	=	9
$dvax_{it}$	overall	77.26418	15.24377	0	98.5	N	=	2250
	between		12.7028	10.32222	98.18889	n	=	250
	within		8.460817	-1.48027	159.842	T	=	9
go_r_{it}	overall	551250.9	457968.6	30191	1977170	N	=	2250
	between		442349.5	49380.4	1716743	n	=	250
	within		121483.4	224590.6	939284.3	T	=	9
go_q_{it}	overall	9.08857	8.380416	-25.6079	34.26182	N	=	2250
	between		3.229554	3.518397	15.0026	n	=	250
	within		7.735532	-31.522	34.73094	T	=	9

The results of the three-model specification – pooled OLS, FE and RE are listed in Table 2. Our interpretation is based on the most appropriate model consistent with the data based on the LM test (Table 3) and the Hausman test (Table 4). The LM test shows that RE specification (column (2) of Table 2) is preferred over pooled OLS (column (1) of Table 2) and that it may not be worth losing out all the information on heterogeneity captured through the data. Further, the Hausman test opts for FE (column (4) of Table 2) specification over the RE specification.

Although the problems of cross sectional dependence is not very commonly observed in short panels (with large number of cross sections and fewer time-series periods), the post estimation test indicates presence of csd in the panel. Therefore, one needs to correct the estimation, as the Panel (FE) estimators are biased and inconsistent. Although the IV is an alternate, finding an appropriate instrument for a panel with a large cross sections ha been difficult. In fact, Sarafadis and Roberstn (2006) have pointed that even the use of IV and GMM provide inconsistent estimates in presence of csd in short dynamic panel models (refer Hoyos et al, 2006, pp3). Therefore, checking and correcting for csd becomes necessary. The pesaran test of csd confirms the presence of csd. Using the abs option shows an average absolute correlation of 0.40, which is high enough to be ignored. This is further corroborated through the Frees and Friedman options of the xtcsd command. Testing for heterosckedasticity though the xttest3 command, confirms that presence of heterosckedasticity in the panel.

In addition to the dva_{it} as the policy variable, a control variable for level of gross output is also included in the model equation to see the response to expansion in domestic output. Alternatively, change on growth rate of output is used to check the behavior of sophistication under conditions of higher domestic output. The results show that domestic output (column (2) of Table 2) or the change in its growth rate (column (3) of Table 2) has minimal (though statistically significant) impact on sophistication. We retain the gross output in the FE estimation of the true model. However, in presence of hetrosckedasticity along with the issues of csd, the Hausman test has poor properties empirically and must be substituted with an alternate test – xtoverid. This makes use the xi option for panel estimation for choosing between RE (column (5) of Table 2) and FE (column (6) of Table 2). The test result shows that FE is the true specification of the model.

The estimations show a negative linkage between India's product level export sophistication and the proportion of domestic value added (DVA) in exports, measured over the period 2004 to 2012. The export sophistication increases with falling share of DVA in export value, an indication that much of the quality improvement occurs through use of imported inputs rather core domestic design and development activity. A one percentage lower DVA proportion in exports supports export sophistication by $27.32. These results are consistent with those observed by Veeramani and Dhir (2017) and the analysis by Goldar et al (2017) on a spectrum of products, although not categorizing the products based on technology or R&D in an explicit manner.[5]

Table 2: Results of Panel Model Estimations

Dependent variable: $prody_{it}$ (measured in $)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Variables/ model	*Pooled OLS*	*RE*	*RE*	*FE*	*RE xi*	*FE xi*
$dvax_{it}$ (as % of export value)	-141.7***	-32.70***	-36.09***	-27.32***	-32.70***	-27.32***
	(12.27)	(7.594)	(10.89)	(7.697)	(10.02)	(9.681)
go_r	-0.00551***	-0.00463***		-0.00328***	-0.00463***	-0.00328*
	(0.000411)	(0.000780)		(0.00105)	(0.00125)	(0.00169)

[5] Although Veeramani and Dhir (2017) observed low DVA in exports as lowering of income, they assert that scale economies actually lead to greater income despite lower value added components.

	(1)		(2)	(3)	(4)	(5)	(6)
Variables/ model	*Pooled OLS*		*RE*	*RE*	*FE*	*RE xi*	*FE xi*
2005.year	908.6	1,025***	904.7***	994.4***			
	(761.7)	(259.3)	(171.2)	(259.1)			
2006.year	2,485***	2,617***	2,259***	2,527***			
	(762.5)	(265.1)	(191.0)	(269.3)			
2007.year	4,847***	4,894***	4,385***	4,751***			
	(763.1)	(272.7)	(253.4)	(282.8)			
2008.year	6,300***	6,587***	5,958***	6,422***			
	(765.5)	(281.6)	(297.2)	(297.1)			
2009.year	3,929***	4,069***	3,297***	3,856***			
	(765.8)	(291.0)	(271.2)	(313.6)			
2010.year	5,073***	5,238***	4,083***	4,925***			
	(770.4)	(323.7)	(293.0)	(366.5)			
2011.year	6,796***	7,437***	6,048***	7,080***			
	(781.1)	(356.1)	(351.3)	(413.3)			
2012.year	6,087***	6,842***	5,407***	6,471***			
	(784.6)	(365.7)	(362.2)	(426.9)			
go_q (logged)			5.947				
			(10.03)				
_Iyear_2005					1,025***		994.4***
					(173.7)		(177.5)
_Iyear_2006					2,617***		2,527***
					(213.4)		(236.2)
_Iyear_2007					4,894***		4,751***
					(285.6)		(316.6)
_Iyear_2008					6,587***		6,422***
					(342.2)		(383.1)
_Iyear_2009					4,069***		3,856***
					(355.7)		(411.1)
_Iyear_2010					5,238***		4,925***
					(436.0)		(522.4)
_Iyear_2011					7,437***		7,080***
					(543.3)		(656.8)

	(1)		(2)	(3)	(4)	(5)	(6)
Variables/ model	*Pooled OLS*		*RE*	*RE*	*FE*	*RE xi*	*FE xi*
_Iyear_2012					6,842***		6,471***
					(542.3)		(652.5)
Constant	27,110***	17,946***	16,310***	16,974***	17,946***		16,974***
	(1,111)	(857.7)	(1,001)	(752.8)	(1,012)		(1,047)
Observations	2,250	2,250	2,250	2,250	2,250		2,250
R-squared	0.192			0.386			0.386
Number of sitc3		250	250	250	250		250

Table 3: Breusch and Pagan Lagrangian Multiplier Test for Random Effects

```
prodyit1[sitc3,t] = Xb + u[sitc3] + e[sitc3,t]

Estimated results:
                 |       Var     sd = sqrt(Var)
        ---------+-----------------------------
        prodyit1 |   8.92e+07       9446.788
               e |    8268660       2875.528
               u |   6.35e+07       7966.623

Test:   Var(u) = 0
                  chibar2(01) =  6854.88
               Prob > chibar2 =   0.0000
```

Table 4: Test for Specification of the Panel Data Model

Test of overidentifying restrictions: fixed vs random effects
Cross-section time-series model: xtreg re robust cluster(sitc3)
Sargan-Hansen statistic 606.676 Chi-sq(9) P-value = 0.0000

Expansion of domestic output of Rs. 0.0328 million improves export sophistication by a dollar. This can be attributed to an output composition with products of low levels of sophistication. Since the base distribution have higher representation of the less sophisticated products, an expansion is less likely to impact overall sophistication in exports.

As is generally the case in any analysis of international trade data, the presence of a time trend cannot be over ruled. For instance, between 2004 to 2014 the increase in trade is attributed to expansion of South-South trade (UNCTAD, 2016). Similarly, India's Foreign Trade Policy focused on export diversification and market diversification policies;

which affected through higher diversification of the export basket (Prasad, et al, 2017). At the same time, specific years can be important for various international or domestic policy reasons. And therefore, there is reason to expect a differential impact on the variable of interest, i.e. sophistication of exports, over years, but not across products. For instance, the effect of exchange rate varies over year, depending on appreciation/ depreciation of currency, but not across products. Likewise, the export performance is expected to vary through signing FTAs with specific partners, e.g. APTA (Bangkok agreement) was signed in 2005, SAFTA in 2006, Mercosur in 2009, and ASEAN in 2010, bilateral agreements or treaties with Sri Lanka (2000), Nepal (1999), Afghanistan (2003), Singapore (2005), Bhutan (2006), Chile (2007), Finland (2009), Korea (2010), Malaysia (2011) and Japan (2011). Since domestic FTAs can have a differential effect, it is natural to expect the effect of a time trend which could also vary for specific years depending upon the policy intervention. Similarly, the collapse of international trade in 2009 and 2015 has been differentiated due the key driving force coming from developed country imports in 2009, while the trade collapse of 2015 was essentially on account of contraction in developing country imports. (UNCTAD, ibid). These trends as well as year specific shocks can be captured through a time varying variable. In the present exercise, although we believe that different levels of export sophistication are related to the corresponding domestic value-added proportions, we think that there might be a correlation between the domestic value added proportion and a point in time, say an FTA coming into force in a given year. Thus, we include the time dummies to avoid the omitted variable bias.[6]

The results show a significant time trend which has been generally upwards with two exceptions. The marked downturn in 2009 is attributed to the global slowdown after the financial crisis of 2008. The slowdown in 2012 has been due to low performance in advanced economy regions such as the Europe while struggling through a sovereign debt crisis in turn affecting export demand in India's export destinations (GOI, 2014). Each of the time dummies is found statistical significate.

V. Conclusions

The paper is an investigation of the relationship between domestic value-added component in export, and the export sophistication of a country to assess if India achieved a quality improvement through indigenous attempts. If indeed this aren't the case, then the quality improvement channel for achieving economic growth through the export link, will either not be sustainable or will expose the economy to international pressures from its import dependency. And, the imports will not contribute to develop an ecosystem of indigenous R&D.

[6] If the time dummy and DVA proportions are assumed correlated, then leaving the time dummies out from the model specification will create a bias in the slope of the policy variable.

The policy variable, proportion of DVA in exports is found to exhibit a negative and statistically significant impact on export sophistication. The negative sign shows that export significance increases with fall in domestic value addition. This in turn implies that exports of sophisticated products, which also belong to the high-technology segment, are paired with low indigenous contribution in the product manufacture. In other words, the finding points to use of high-tech imports, and less inputs from the domestic sector. The subscription to imports for exporting high tech products reflects upon the deficient domestic R&D needed to bolster innovative practices such as product design and engineering.

From a policy perspective, there are two options, not necessarily mutually exclusive. First, there needs to be conscious effort to indulge in production stages characterized by high domestic value addition content. These options are mostly concentrated in the initial stage of product production such the design and engineering. For this, policies that encourage domestic R&D and innovation require attention. Second, since the results of domestic R&D and innovation are a solution that will be effective in the short run, a relatively quick correction of the low levels of domestic value addition can be through import substitution of the part and components under the government's Make in India Initiate.

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